REPORT

ERIC - PROJECT

EFFECT OF SINGLE MODALITY STIMULATION UPON SPEECH AND LANGUAGE DEVELOPMENT OF HARD OF HEARING CHILDREN

Investigator

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The work is dedicated to
the hearing impaired children
participated in the project.

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CHAPTER - I

INTRODUCTION

1.1 BACKGROUND :

The principal investigator has been working as clinical audiologist. As a part of her services, she has been visiting various special schools in Maharashtra State. These schools are from urban as well rural areas. There are certain common observations in all these schools. They are (a) Hearing impaired children fail to demonstrate adequate language development. (b) Despite giving heavy emphasis on " speech development and corrections ", hearing impaired children demonstrate poor intelligibility of speech. (c) Gross signs are commonly used by children as well as by teachers; though sign language is not formally accepted by the schools (d) Undue weightage has been given to fitting of individual hearing aids, but the auditory training is the neglected part by the teachers (e) There is often incorrect fitting of hearing aids and children have dislike towards hearing aids. It has been also observed that hearing impaired children do demonstrate delayed language development and their functional language often lags behind by two to three years (1.2); but the informal survey revealed significant lag i.e. more than three years in language development. None the less, the teachers seemed to be satisfied with number of words i.e. most often nouns, learnt by these children. But

children do not exhibit any spontaneous language. They find difficulty in expressing their emotions. There does not exist any language skill norm developed for these children . So children from various schools studying in any specific class will have different competency level in vocabulary and also in language skills. Special school curriculum is not at all compatible with normal school curriculum. The heterogeneous group is the common feature in the hearing impaired population, and their needs are not catered by the teachers.

Hearing impaired children are often with multiple handicap like mental retardation, learning disability. Similarly, multiculture and multilingual features are also precipitating factors for delayed language development. Emotional maladjustment, sensory deprivation are other factors which have adverse effect on language development. Teachers need to understand these factors and also need to understand children's need and potential for language development. The observations revealed that teachers have difficulty in identifying children's need. They have also difficulty in planning

.. 3 ..

individualized speech and language program. These limitations may be attributed to lacunae of teachers training programme.

The teachers' training programms have highlighted multisensory approach i.e. TVA approach for speech and language stimulation for hearing impaired children. This approach recommends tactile, visual and auditory stimulation to its maximum capacity to cater the needs for language development. Hence amplification has become the key word. Children are given individual hearing aids. Classrooms are furnished with group hearing aids and speech trainers. But it has been observed that children do not receive significant stimulation through auditory channel. The recent report on deaf education in India (3), indicate that these schools are poorly equipped with auditory stimulation instrumentation. However, informal observations done by the Principal Investigator suggest that most of the special schools are furnished with group hearing aids, speech trainer and individual hearing aid. However, these observations are limited to Maharashtra State. Benefits of group of hearing aids, speech trainers, induction loop system may be reaching to 60-70% of hearing impired children from

special schools and more than 90% of children do have individual hearing aids. It has been also observed that although, children are given individual hearing aids there are more incorrect fittings. Hence children often reject the aids. There are various factors attributed to rejection, they can be listed as follows :

(1) Hearing aid is prescribed without audiological evaluations.

(2) Hearing aids are fitted without custom fit mould.

(3) Ear hygine is not taken into account, children from low socioeconomic background, often have discharging ears. Discharging ear or impacted wax are barrier for sound transmission.

(4) Maintenance of the hearing aid is a poorly defined concept for parents and teachers; hence hearing aids are without batteries and/or with poor quality cords.

(5) There is a strong social stigma for hearing aid, hence parents often discourage children from using hearing aid in other than school environment.

(6) Parental attitude, and poor reinforcement from teachers do not provide any encouragement to children to use hearing aid. Children often fail to understand need for amplification. They prefer to be in the silent world (4) .

(7) Most of the hearing impaired children have severe to profound hearing loss, hence their residual hearing with amplification is inadequate to comprehend language through auditory modality. What they receive is essentially awareness of sound. Hence children fail to appreciate amplification.

(8) The auditory dynamic range does not provide enough room for amplification. The dynamic range is defined as, difference between threshold of discomfort and most comfortable listening level. If this difference is less than 30 dB, candidate is considered as poor candidate for amplication (5). This feature is neither taken into account, during hearing aid fitting nor is considered during academic programme.

(9) Recruitment, (low tolerance for lound sound), tinnitus (constant ringing in the ear) are also other physiological barriers for amplification (6).

(10) Educators have always emphasized early intervention programme for hearing impired children, since " critical age " for language learning is considered as 1 to 3 years (5,6). But early intervention programme in India is far from reality. None the less,

children start their academic programme by the age of 6 onwards. Hence child is deprived from auditory stimulation for six to seven years. Theory of sensory deprivation (7),suggests that children with profound hearing loss may not gain any benefit with amplification if introduced after age of critical language development.

Above discussion made it clear that there are good number of children in special schools who are poor candidates for amplification. Adult hearing impaired individuals having severe to profound loss do not like to wear hearing aid (5,6,8). Similarly, children in special schools may also have dislike towards hearing aid, but these children are neither identified, nor permitted to remove hearing aid.

The speech and language development programme is based on multisensory stimulation. But informal discussions with teachers from various school revealed that teachers have reservation towards this approach and it was also noticed that they did not have any confidence in unisensory approach.

Visual speech receptation has been most commonly accepted approach. To speech read, the child has to watch the speaker's face; observe the movements of the lips, jaw and as far as possible the tongue. That means vision has been utilized as a substitute for audition among hearing impaired. None the less, it is not the effective alternative, but it has been the only other distance sense available. The purpose of this project is to study single modality approach for speech and language development.

1.2 Statement of the Problem : Single modality (visual or auditory) stimulation to its maximum capacity should reflect positively upon speech and language performance of hearing impaired individuals.

1.3 Hypotheses :

(1) Single modality stimulation can facilitate good language development.

(2) Visual or auditory modality stimulation demonstrates similar language development,

(3) These developed language skills are superior than multimodality stimulations.

.4 Assumptions :

(1) Every hearing impaired child has a modality preference.

(2) Auditory training and/or speech reading skills can be used to maximum extent for language development.

(3) Children with profound hearing loss can not be matched with children with severe hearing loss.

(4) Onset of hearing loss, degree of hearing loss and configuration of hearing loss attribute difficulties in equating.

(5) Age of intervention of program, quality of training programme and environmental factors contribute to langugage development. Hence there are built in difficulties in scoring of language skills.

5 Objectives :

(1) To measure hearing loss of children participated in the project.

(2) To form a homogeneous group in the classroom with reference to hearing sensitivity along with chronological age.

(3) To evolve a scale for measurement of language skills.

(4) To find out individual needs of the student and to plan an individualized programme of language development.

(5) To identify speech problems and to grade quality of speech and voice.

(6) To offer speech correction programme.

1.6 Significance : There are no actual experiments done in special schools, regarding teaching methods. There is no universalization of teaching methods and of objectives. Special schools have poor funding and have difficulties in getting qualified staff. Therefore, it has been difficult to upgrade the standards of special schools, and also has been difficult to make these programes compatible with mainstream programme. This project will demonstrate that children can be taught without any auditory gadget. And in any special school, profound hearing loss individuals can do equally well with moderate to severe loss children. Spending minimal amount on various electronic gadgets will bring a cost effectiveness in school management. Children need a structured programme and a good follow up can bring desired effect in children.

The project will provide a ready structured content program to the teachers in special schools, to meet their needs in a classroom. A design to form a homogeneous group of hearing impaired children will enhance children's progress in speech and language

development. Children can learn language skills effectively and in comparatively short duration, if proper modality stimulation programme is implemented.

1.7 Scope :

Teachers may be given in service training programme to upgrade their knowledge in the field of hearing science and language development. Hearing impaired children often demonstrate pseudoretardation. Once a structured programme is implemented with individualized approach , pseudoretardation can be removed. Similarly, children from special schools may be involved in mainstream programme at the earlier stage. The teachers will be able to implement language training programme effectively and hence the curriculum of special schools can be made compatible with normal schools.

1.8 Limitations :

(1) This project has taken into account hearing impaired children who received intervention programme at the age of six onward. The assumptions may not be applicable to children who are identified between 0 to two years of age.

(2) The self evolved tool of language assessment is not a standardized test, therefore, there may be some lacunae in the test itself. The tool does not test receptive skills of language development.

(3) This project is implemented to the children who have Marathi as a primary language. A generalization for other languages and for bilingual children can not made.

(4) The project is limited to the state of Maharashtra.

(5) Group equating difficulties and scoring difficulties due to diversity in hearing impairment and large variation in language development could not controlled effectively.

CHAPTER - II

LITERATURE OVERVIEW

2.1 INTRODUCTION :

From ancient times through the middle ages, history records very little acceptance of deaf persons as rightful members of society. Because of their inability to speak and to use the language common to the general culture in which they lived, deaf persons were considered to be unable to learn, and they were regarded, for all practical purposes, as mentally handicapped(9). Teaching deaf children began to flourish as a profession in the 18 th century, as more and more children were provided with formal instruction. As teaching opportunities increased, so did the contraversies over methodologies. None the less, there has been well established relationship between hearing, language acquisition and speech development.

The importance of aural rehabilitation to the hearing impaired can not be overemphasized. Hearing impairment may be accompanied by many problems, the most outstanding is the breakdown in communication. Helping the hearing impaired individual to overcome

this problem is the task of teachers from special schools. As Ross (2) has pointed out, " Our immediate therapy goal is the improvement of communicative abilities, our eventual goal is a well- adjusted and a productive individual ". Such management may include speech reading, auditory training, and speech and language therapy.

Speech reading :

Speech reading was defined by Nitchie (10) as " the art of understanding a speaker's thought by watching the movement of his mouth ". Another definition of speech reading is a paraphrase of a definition of reading (10). Reading has been defined as the gross process of looking at, perceiving and interpreting written symbols. In like manner, speechreading is defined as the gross process of looking at, perceiving and interpreting spoken symbols. The total process which involves following steps (1) sensory reception of the motor or movement pattern. (2) perception of the pattern (3) association of the pattern with meaningful concepts (4) Mental replacement or fill-in information which is not received in order to complete both steps two and three.(15, 19).

2.2.1 Terminology - Speechreading or lipreading?

Both of these terms, speech reading and lipreading, are used today to describe the art of gaining information about what is being said by watching the lips and facial expression. Lipreading term was used almost exclusively from the 1900's upto the 1930's. The word lipreading implies the skills of watching the lips in order to improve comprehension. Now most widely accepted term " speech reading " implies reading of speech movements i.e. observing lip, jaw and tongue movements that are made by the speaker, as well as his facial expression (10).

2.2.2 Speech and reading and language development :

Speech reading aims at developing language i.e. word meanings, structural meanings, morphemic aspects, and syntax; along with developing speech reading skill. In this kind of instruction speech reading is used as a basic tool, along with other tools, such as visual aids and silent reading, to develop the child's ability to understand lanaguage and to permit him to acquire a knowledge of word order and a large enough vocabulary to think in terms of language; (10,6). This is the kind of approach used with the

profoundly hearing impaired children. Initially, speech reading is learned word by word, though some attempt is made from the first, to teach simple phrases and senstences, as a whole. Once a word is understood, it should rarely be presented except in a meaningful sentence. Words seen on the lips are associated with the objects or ideas they represent. The child sees the speech patterns and the correct grammatical pattern on the lips over and over again until he associates these movements with the idea the speaker is wishing to convey. But because motor movements are limited and do not convey the complete message,learning is enlarged and reinforced with almost simultaneous presentation of visual aids, such as, objects, pictures and actions, along with the printed word. The child must develop a knowledge of structural as well as lexical meanings at the same time that he acquires the skill of visual recognition of oral language (9,10). The way the deaf child learns through seeing the words and correct sentence structure over and over again in a meaningful situation, through speechreading and silent reading- is somewhat

analogous to the way the hearing child develops his lanaguage through hearing words and sentence structure over and over again in meaningful situations (10).

2.2.3 Limitations of speechreading :

It has been considered as speechreading can supplement hearing but it can not substitute for hearing (10,11). That can be understood clearly, since if vision were a natural avenue for speech comprehension, there would have been no need for special schools for hearing impaired. Our language is an auditory phenomenon, one designed for hearing and not viewing (5). As a vehicle for visual communication, it is very severely limited. The limitations comprise at least six; they are (1) low visibility of speech sounds (2) homophenous sounds, (3) rapidity of normal speech (4) transition effect (5) individual differences in sound formation (6) environmental limitations (8, 10,11).

2.3 Auditory Training :

Auditory training has been defined in a number of ways. Carhart (1960), father of audiology states that auditory training is the process of teaching the hard of hearing to take full advantage of sound

cues which are still available to him (8). Ross(1972) states that auditory training is actually the systematic training of residual hearing for the improvement of auditory abilities (2). Kelly considers the goals of auditory training to be improved awareness, discrimination and retention of speech sounds (8). Based on these definitions and experience, objectives of the auditory training can be defined as follows:

(a) The development of auditory speech perception.

(b) Better speech, which includes greater intelligibility, more natural voices and rhythmic speech.

(c) A broader and more flexible language development.

(d) Acceleration of the general education programme as a result of improved communication skills.

Achieving above stated skills will certainly reflect upon higher attainments in scholastic subjects, better social and emotional adjustments of hearing impaired individuals. That is one of the ultimate objectives in total rehabilitation (5,11,13). The specific goals for auditory training are to develop an awareness of sound and its referential function. This stage is necessary for young hearing impaired individual for whom the provision of amplification makes sound audible for the first time.

The environment suddenly bombards him with sounds that previously were either inaudible or very soft. These amplified sounds are strong and perhaps even frightening, hence, an amplification to be accepted by the child, he must be taught to make use of the sound patterns he is receiving (5,19).

Limitations of auditory training :

The hearing impaired children having profound hearing loss are generally learned to depend upon vision and touch as their primary means of receiving information. Since the early identification and early intervention programms for hearing impaired individuals are far from reality; it is indeed essential to take into account a " theory of sensory deprivation ".

Deprivation Hypothesis was proposed by Katz and Epstein in 1962 (7). A group of mice was raised in deprived acoustic conditions. The animals were studied at 45 days of age. Under magnification, abnormalities were found in the auditory pathway upto the brainstem level (7). If the peripheral and the central auditory system have been deprived

from acoustic stimulation from a prelingual stage; hearing impaired individual may require extensive auditory training programme or despite the extensive programme child may not respond due to the maldevelopment of auditory pathway. In another study Schuknecht, Kerr (12) reported that in normal hearing subjects average ganglion cell population is 20,000 and it varies from 18,000 to 37,000 cells. But for some capabilities of speech discrimination minimum of 10,000 spiral ganglion cells are necessary. The Investigators have also found that the ganglion cells population were largest in ear deafened by sudden deafness, Meniere'sdisease and ototoxic drugs. They were least in cases with measles and bacterial labyrinthitis (12). The informal observation done by the Principal investigator revealed that hard of hearing individuals often suggest the history of infectious diseases which lead to hearing loss.

Above discussion makes it clear that there are good number of hearing impaired individuals who exhibit poor performance on auditory training programme either due to sensory deprivation, Also ,intervention programme begins much latter than the critical age

of language development or there is another possibility of that the limited ganglion cells can not process all the information brought in through the amplification. These hearing impaired individuals can not make most of their individual hearing aids. There is no point providing them hearing aids. Despite their hearing aids, these individuals find their own way of communication i.e. sign language. The principal Investigator has observed that sign language has been used by many hearing impaired individuals, however, sign language is not officially approved mode of communication in the special school system. Only alternative left to these children is use of speech reading (lip reading).

2.4 Tactile stimulation :

The tactile stimulation is another mode of stimulation. Arrow Smith discussed the advantage of providing tactile stimulation to teach speech reading to young deaf children, as early as 1819 (13). Subsequently, educators devised different ways of using the sense of touch in co-ordination with the visual system to supplement the child's loss of hearing. Later, Alcros (1932) proposed the Tadoma

method, which is also known as oral or vibration method (13). The fundamental principle of Tadoma method is to emphasize vibration feeling of muscular movements as primary avenues for training oral language. In Tadoma, the hearing impaired child is first taught to feel vibratory patterns and muscular movements of the facial region by selectively placing his or her hands on the speaker's face. After vibratory patterns have been learned, the child is taught to initiate the speaker's vibratory patterns. Auditory and visual cues are included as supplements to touch and movement if the child has adequate visual acuity and some residual hearing.Theoretically Tadoma aids in teaching rhythm, accent and pitch (13). Vibration is used as a reference for the child to develop concepts for visual patterns of lipreading and writing skills. Tadoma,has reportedly been successful with the deaf and deaf blind (13). Various studies have indicated benefits of tactile stimulation (14.).The tactile stimulation has been used in combination with auditory prosthesis, and hence,it has become multimodality stimulation programme. The classroom teachers have expressed reservations to use tactile stimulation as a single modality stimulation (14).

Language Learning :

A fundamental question needs extensive study to know whether tactile stimulation can be substituted to auditory stimulation for language learning, the extensive research work is awaited in this area, hence for present situation there remains only two modalities visual and auditory for verbal language acquisition; in other words, verbal language acquisition typically is based on auditory- vocal mechanisms. In this sytem, hearing is the controlling element. Hearing allows the constant intake of auditory events, including speech, the storage of internal representations of the auditory events, and automatic control of the vocal mechanism to reproduce the events. The whole process is controlled automatically by hearing. Hearing is the key to the system and, when hearing is damaged or destroyed, the system is disrupted, it can no longer function as a system with fluent and automatic control of its own operation (9,6,11).

If an automatic, self- controlling communication system is essential for normal development of language,and if the auditory-vocal mechanisms,provides that system for hearing people, there appear to be

three ways to provide a system for deaf children (9).

(1) To repair the defective auditory component to the extent that the auditory- vocal mechanisms would be a functional communication system.

(2) To substitute other physiological mechanisms for the auditory vocal mechanisms, such as vision for audition and manual for vocal.

(3) To use the auditory- vocal mechanisms as much as possible and to supplement them with the visual-manual mechanisms. Each of these three ways is the basis for a major approach to educating deaf children with the main objective for all being to produce as normal and adequate development of language as is possible.

Although, there have been various methodologies for language instruction to the hearing impaired, the objectives of these methods have certain features in common, they are

(1) All hearing impaired children have an innate ability for learning the system of lanaguage.

(2) The hearing impaired child needs to be allowed to go through the natural stages of language development. To achieve this goal, language instruction approaches are (a) structured approach

(b) natural approach (c) combined approaches.(6,9,15).

2.6 Structured Approach :

Structured method treats language analytically and prescriptively, emphasizing rules of grammer. Processes involve direct imitation, memorization and drill. The hearing impaired child is expected to achieve grammatically perfect version of the language, accepted by the society. The assumption underlying language learning through the structured or combined approach is that language development depends on experiences with meaningful language combined with a structured organization of language form for the expression of those experiences (1, 9, 16).

The structured approach is frequently referred to as the the formal, grammatical or analytical method. This method involves explicit instruction in the components of language and a visual coding or symbol system that represents the order or relationships within each components (1) which is referred to as " metalanguage " by king (17). "Metalanguage is language used to talk about language, and the symbol systems used in program s for hearing impaired children provide teachers and students with a means to talk about language. Terms and symbols such as noun, verb, pronoun, relativization, sentence pattern are all examples of metaliguistic symbols " (17). Providing the hearing

impaired child with carefully constructed modeling and metalinguistic forms implies that the child will be able to acquire normal language skills. The assumptions inherent in the structured include the following (1) the hearing impaired child is able to acquire the structure of language through imitation of models (2) repeated exposure to specific structures of language will enhance the child's rate and skill in the use of correct language form. (3) external and explicit cues, such as metalinguistic symbols will provide the deaf child with a reference or reinforcement mechanism that can be used as a guide for linguistic construction or correction. Examples of users of structured approaches to language development have been de I Epee and Sicard in France in the second half of the 18 th Century, Clerc and Gallaudet in the United States in the early to late 19 th century, and Barry and Fitzgerald in the United States in the first half of the 20 th Century (6,9,18).

2.7 Natural Approach :

In the natural approach, language is treated holistically, and development is planned to parallel

the sequence of language acquisition in hearing children (9). The hearing impaired child is expected to acquire language principles inductively and unconsicously through constant exposure to appropriate language patterns in situations, that are designed on the basis of child's needs and interests. Rules of language are not taught explicitly but the approach implies that the deaf child will absorb the rules unconsciously through exposure, limitation and expansion without memorization or language drills (9,18).

The basic assumption underlying the natural approach to language learning, although unproved, is that hearing impaired children develop language by progressing through stages and sequences in a manner similar to hearing children (9). The principles which provide guidelines for developing language goals and intervention strategies are (1) language involves interactions among the components of content, form and use,(2) information about normal language development is the basis for determining language goals and intervention strategies,(3)language is

learned through communication (4) communicative competence is the ultimate goal of language development (6,9.18).

Natural approach to language development for deaf children are at present the most widely accepted and advocated in the United States and many other countries (9,18). At the Maharashtra State level, natural approaches are considered as the recommended as well as practised processes. The literature support is the one good reason to practice natural approach. However, no comparative study for structured method and natural method has been reported in Indian literature.

CHAPTER III

MATERIAL & METHODS

The project was discussed with various experts involved in the project and an outline for the total programme was formed. Criteria for selection of children, tools to be used for language evaluation and for teaching methods were discussed and formed with the help of speech pathologist, Mrs Aruna Sangekar.

Preparation : The schools participated in the project were (1) Smt. Mai Lele Shravan Vikas Vidyalay, Nasik (2) Vinaykumar Lohia Muk Badhir Vidyalay, Kolhapur. These schools' were selected for following reasons. (a) These schools are only special school for hearing impaired children in Nasik and Kolhapur cities, hence they are isolated and teachers have had minimal exposure to update their knowledge with the current trends. (b) There has been no training center at these two cities, so that, the research activities have been at the minimal level (c) A personal rapport has been established with these schools, since 1987; and teachers appeared to be enthusiastic to carry out the project work.

Selection of Teachers : The school authorities were informed regarding the objectives of the project and the scope of this project. The authorities were

requested to nominate two teachers from the school, who would be able to carry out the project. No specific criterion was applied in selection of teachers.

Selection of children : The children who participated in this project were selected using two criteria.

(1) Chronological age between seven years to nine years. The assumption was, child had received minimum of one to two years of formal training in the special school; which indicated that minimum skills of speech reading and skills of auditory training have been achieved by these children. Similarly children have some degree of proficiency in receptive as well as expressive language.

(2) Degree of hearing loss was another criterion used for the selection of these children. The International standard Organization- ISO 1964 (6), has defined 70 dB to 90 dB hearing loss across the frequencies as a severe degree of hearing loss. And 90 dB to 120 dB hearing loss across the frequencies as a profound hearing loss. 10 children in severe hearing loss category and 10 children in profound hearing loss category were selected from both the schools. In severe hearing loss group, hearing thresholds for for 250 Hz, 500 HZ, 1000 HZ, 2000 Hz were within defined range in both ears, and 4000 HZ demonstrated

no hearing at the audiometric limits in either ear were also considered. There were five children with such audiometric configuration. For profound hearing loss, more than 50% children demonstrated residual hearing for 250 HZ, 500 HZ, 1000 HZ and no hearing at the audiometric limits for 2000 HZ, 4000 HZ in either ear. All the forty children had individual hearing aids. All these hearing aids were serviced and checked by the Principal Investigator. The periodic check up for the hearing aids was done during the project.

3.1.3 Equating the group : The children from Chinchwad Muk Badhir Vidyalay, Nigadi, Pune were selected using above mentioned criteria and were matched with the experimental group. These children were considered for control group. Although all the efforts were made to select children with single handicap, i.e. hearing impairment, under this project; three children from Nasik demonstrated multiple handicap. Two of them, from the speech reading group, were physically handicapped and their mental abilities were age appropriate. No obvious mental subnormality was observed in either of them, but formal I. Q. evaluation was not done. Another individual (F/8 years) from the auditory group was a case of convulsion. According to the teachers she was a slow

learner but in an educable category. Formal psychological evaluation was not done, since such facility was not available. Teachers from Kolhapur school did not reveal any notable history for these children, because 50% of the school children were receiving residential facility. It was likely that enough case history was not at the disposal of the school authority.

The distribution of cases were as follows :

Case Distribution

Table No. 1 - A Speech Reading Group

Experiemental Group		Control Group	
Nasik	Kolhapur	Pune	
7 Females	6 Females	2 Femalles	15
3 Males	4 Males	8 Males	15

Table No. 1- B Auditory Training Group

Experimental Group		Control Group	
Nasik	Kolhapur	Pune	
8 Females	7 Females	4 Females	19
2 Males	3 Males	6 Males	11

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Orientation Programme : The four teachers who volunteered to be part of this project, were called at Tilak College of Education, Pune for one day orientation programme on 24 th Sept. 1989. The experts

were invited to participate in the project. They were Dr. V. S. Deshpande, Dr. Suman Karandikar,Mrs.Aruna Sangekar, Vice Principal S. M. Dighe.

Dr. Deshpande provided the guidance in the area of language development with special emphasis on concept formation. He highlighted combined approach (natural approach and structured approach) for language stimulation. Dr. Suman Karandikar's lecture was on " observation as a tool ". She enlighted the teachers with how to observe and why to observe child's behaviour in the class room. She also discussed the objectivity in these observations and certain loop-wholes in these observations. The deaf education has been considered as a social service and role of the teachers involved in deaf education has often been glorified by the parents of hearing impaired children. Hence Dr. Karandikar's lecture appeared to make significant change in teachers.

Mrs Aruna Sangekar discussed the objectives of the speech and language test evolved for this project. She also discussed the expected outcome on the test and how it would be compared with control group. Vice Principal S. M. Dighe discussed unit planning for language teaching. She revealed the model unit

plan along with the objectives of the unit procedure and evaluation of the Unit. The teachers were also explained the selection of children, criteria to be used for selection, time management for the activities to be conducted in the school, and procedures of record keeping.

3.3 Language evaluation : A self evolved tool for language assessment was used in this project. It was decided to assess the language development of each hearing impaired child prior to the project and after the completion of the project; in order to judge the improvement in language skills and usage. A self evolved test for language assessment was designed for this purpose and was used during this project. The standardized tests could not be used for the following reasons.

3.3.1 Why self evolved test? Most of the tests for the language development are based on data related to normal speech and language development. Therefore the same test can not be applied to hard of hearing children. Similarly the hearing impaired children formed a heterogeneous group in terms of language competency. This diversity was attributed to degree of hearing loss, onset of hearing loss, age of

had received two to three years of formal training. They have had some degree of expressive language, that had been a prerequisite of this project.

2. Expressive language comes only after receiptive skills are developed. That meant receptive skills were tested indirectly.

3. Major thrust of this project was to measure expressive skills only.

4. Where children failed to elicit any expression receptive skills were tested; but no elaborate tool was used for the same.

intervention programme; and child's potential to learn language despite the hearing impairment. It was essential to have a common test for all of them, so no ready made test would have been useful.

3.3.2 Rationale of the test : To measure a size of vocabulary was a difficult task and environmental factors do attribute a lot in language learning. To control the environment would have been an impossible task. Therefore it was thought that the usage of different components of language, (grammatical structures), such as, nouns;verbs;adjectives genders, singular, plural, prepositions, articles etc. should be evaluated. Their usage in communication prior to the project and after the project should serve as a yardstick for measuring Children's language proficiency. It was essential to test two aspects of language-comprehension and expression independently. However, no attempt was made to measure comprehension level of a language. There were certain assumptions made, they were:

1) Most of the children selected in this project

3.3.3 Description of Test :

The details of each subtest are as follows :

Subtest I : Test for Nouns

Score 10 Points

Method : 6 pictures of common objects and 4 common objects were shown to each child. The child was supposed to name these objects.

Scoring : The articulation errors were not taken into consideration while scoring. I point was given for each correct response. Any attempt to describe word or to explain using gestures was considered as a wrong response.

SUBTEST II : Test for Ability to use nouns in sentences.

Score : 5 points.

Method : The child was shown 5 pictures, one at a time. He was asked to describe the picture using a sentence. For exp. - The boy is reading a book. For each answer a particular word was decided as a target word. Other words, verb etc. were not taken into consideration. A particular noun was a ' target word '. If this noun was used correctly 1 point was scored.

SUBTEST III:

Test for ability to use noun as a answer to question

Score : 5 points

Method : 5 pictures were presented to a child, one at a time. A question was asked which required one word

(noun) as a answer.

FOR exp. : A cat drinks milk. What does cat drink?

Ans : Milk(target word)

Scoring : Articulation errors and other words in the sentences were not taken into consideration. Only the target word was considered and if it was correct one point was scored.

SUBTEST IV : Test for singular and plural.

Score : 10 points

Method : 5 pairs of pictures were made and one pair was presented at a time. A pair represented object in singular and plural for exp. book, books. A picture showing single object was shown first and then the picture showing same object in plural.

Scoring : The child was supposed to name object in singular and say, it as a plural with appropriate changes. Articulation errors were not considered. Each correct response was scored for 1 point.

SUBTEST V : Test for gender

Score- 10 Points

Method : 5 Pairs of pictures were made each representing gender change.

For Exp. : Cock-hen, lion-lioness, boy, girl etc.

One pair of pictures was shown to child at a time and he/she was supposed to name it.

Scoring : Each correct response carried 1 point. Articulation errors were not taken into account.

SUBTEST VI :

TEST FOR ADJECTIVES

Scoring : 5 points.

Method : 5 pairs of pictures were made. In each pair, two adjectives, opposite in nature were represented for example- A fat boy- A thin boy. The child was asked to describe the picture. If he couldn't; a clue was given, saying the adjective related to one picture. For exp.- He is a fat boy. Describe the other boy. A target word was decided for each pair of pictures.

Scoring : 1 point was scored for each correct response (target word). Articulation errors were not taken into account.

SUBTEST VII : TEST FOR VERBS - SCORING : 5 points

Method : 5 pictures 1 each showing a specific action were made. The child was shown one picture at a time and was supposed to describe the action using appropriate verb.

Scoring : No other words except verbs were considered. The use of proper verb was considered as a correct response. The choice of correct verb was the criteria of the correct response.The changes in verbs according to subject and tense were not taken into account. Errors in articulation were nelgected. Each correct response scored one point.

SUBTEST -VIII

Test for ability to change verb according to subject and tense.

Scoring - 10 points.

Method - 5 Pairs of pictures were made showing some actions. The child was asked to describe these pictures While describing the pictures, the child was supposed to make specific changes in verb and arrange it according to subject or tense ·

exp- The boy is drinking मुलगा पाणी पितो.
The girl is drinking मुलगी पाणी पिते

The verb was a target word which was supposed to match with subject and tense.

Scores : 1 point was scored for each correct response.

SUBTEST-IX

TEST for prepositions

Score- 10 Points

Method- 10 pictures requiring use of a specific prepositions for their description were made exp. The clock is on the table. The prepositions used were on, under, in, behind, etc. The child was shown one picture at a time and was asked a question. The answer required use of a specific preposition which was considered as a target word for that picture.

Scoring : Each correct response scored 1 point. The other words in sentences, articulation errors were not taken into account.

SUBTEST X :

Test for Articles

Score - 10 Points

Method - 10 pictures were made, each representing a action. One picture was shown to the child at a time and a question was asked. The answer required the use of specific article which was the target word for that picture.

for exp. मुलगा कुत्र्याला बिस्कीट देतो.
मुलगा कोणाला बिस्कीट देतो ?
मुलगा कुत्र्याला बिस्कीट देतो.

कुत्र्याला
(Target word)

Scoring : No other words except the target word were taken into account while scoring. Each correct response scored 1 point.

SUBTEST : STORY TELLING

Scores : On Rating Scales.

Sequential order was shown to a each child. The child

was asked to make the story from the pictures. The judgements were made regarding the following

1) Intelligibility of speech

   Very bad, Bad, Fair, Good, Very good

2) Use of gestures

   less- appropriate- more than required

3) Use of sign language.

3.3.4 Test Procedure : This self evolved language test was administered to each child, participated in this project. The test was administered by the teachers who participated in the project, this was with the intention that the child should be able to speech read well and should be able to understand the instructions. The scoring was done by two judges independently. The scores were recorded on the prescribed record sheets. Most of the time, two judges were evaluating performances of children, but on few occassions scoring was done by the single judge. The subject was constantly encouraged and motivated to elicit the best response during test procedures.

3.3.5 Calender events of language evaluation : The test was administered three times (1) pre test evaluation (2) interim test evaluation, just before schools were closed for their summer vacation (3) post test evaluation. Experimental group received all three tests. The schedule was as follow

November 1989- December 1989 -	Pre test evaluation .
March 1990	Interim test evaluation.
August 1990- September 1990	Post test evaluation.

The control group did not receive interim test.

3.4 Speech Evaluation : Speech evaluation of every child participated in this project was done by the teachers. Under speech evaluation every consonant and vowel were evaluated on the basis of placement of articulation, manner of articulation, voicing (15). Similarly every consonant in initial position, in middle position and in final position were assessed. Voice quality was assessed independently. Teachers were also asked to keep progress report on speech corrections done on individual child and progress made by the child.

3.5 Commencement of training program : After completion of the pre test language evaluation, formal training programme started in December 1989. The Principal Investigator made regular monthly visit to each school and the strategy for every month's activity was discussed. The children in speech reading group had received maximum visual stimulation. However, total removal of individual hearing aids could not be done, as there was a tremendous resistance from parents as well as from the teachers from the school. Hence hearing aids were removed during project activity. The monthly activities scheduled were as follows:

December 1989 : Children should speech read or listen to 'who' and 'what' question and should answer a question in a complete sentence, e.g. " what is this?" This is a ball ". " Who is this? " " This is a postman ". Words were selected from real people and real objects and also common to the child's environment.

January 1990 : The emphasis was on to teach adjectives. Teachers had been teaching set of colours, set of shapes. Children often learnt to name colours like red, yellow, pink but found extremely difficult to name " Red kite ", " Yellow banana ". Hence teachers were asked to concentrate on two words sentence level like " adjective + noun". Teachers were given freedom to choose a set of adjectives and to make necessary visuals for the same. In the same month another focus was on teaching of ' singular- plural ". It was observed that a concept of plural was based on " a set of quantity " but a plural with appropriate changes in the noun was not used by the children. So the teachers were asked to concentrate on concept of singular and plural with appropriate changes.

February 1990 : Focus was on teaching gender. The concept of gender especially related to animal world was poorly developed in children. Teachers were asked

to make pictorial presentation of gender like a husband and wife; a boy and a girl,' a lion and a lioness '. Children were taught the concept of gender.

Half way through the project it was observed that teachers' motivation level was lowered significantly. They often gave excuses for not completing the assignment or the target plan. It was also observed that significant gaps existed in the philosophy and objectives of special education programme. Hence teachers from both the schools were called to Poona. Informal discussions with Dr. Lata Pranjape Co-Investigator of the project; and resource persons Mrs. Sheela Kakade, Mrs. Aruna Sangekar were arranged. Teachers reported their difficulties to carry out language stimulation programme as well as individual speech correction programm simultaneously. Hence it was decided to concentrate only on language stimulation activities and speech correction program was deleted from the project.

March 1990 : Activities were geared up with teaching of prepositions. Significant field trips were arranged by the teachers.

March 1990-April 1990 Interim language evaluation was done at Nashik and Kolhapur, as schools were breaking for their summer vacation. This interim test

was not given to the control group.

June 1990 : Schools reopened in June 1990 but teachers requested to start the final part of the project from 1 st July 1990.

July 1990 to August 1990 : This time was used to teach patterned approach to the development of connected language skills, as used in Fitzgerald Key Method (6,9,19). The patterns of commands were selected as the foundation for building more complex structures in the language. Patterns from the Fitzgerald key were organized around the commands most frequently used in the child's environment. The examples of the patterned approach are as follows :

Pattern	Example
Verb + What	Clean the table
Verb + Where	Come home
Verb + What + where	Put your shirt in the cupboard.
Verb + adjective	Be good.
Verb + whom	Help your teacher.
Verb + Whom + what	Give me a glass of water

The final language evaluation started in the month of September 1990 and all sixty children were tested. The outcomes of the project are discussed qualitatively and quantitatively in the following chapter.

CHAPTER IV

OBSERVATIONS AND DISCUSSION

The single modality stimulation project was aimed at to compare and to contrast effect of modality stimulation upon speech and language development of hearing impaired children attending special schools. The teachers orientation programme held on 24/9/1989, provided complete overview of the project. The teachers appeared to be satisfied with the orientation programme. They expressed that their confidence level has increased significantly. They were delighted to be the part of the project. Teachers also expressed that their contribution in this project would certainly bring desired results.

4.1 Selection of Children : The children who participated in this project were selected using two criteria (a)chronological age (b) Degree of hearing loss. Teachers were requested to select the children with their previous recorded audiograms; but all the children underwent hearing evaluation in the month of September 1989 and October 1989. Following tables described distribution of cases according to the chronological age and degree of hearing loss.

Table- 2 A Speech Reading Group.

Experimental Group		Control Group			
Nasik		Kolhapur		Pune	
Sex/Age	Av.Hearing loss	Sex/Age/	Av.Hearing loss	Sex/Age	Av. Hearing loss
F/9yr	95 dB	M/7 yr	100 dB	M/10yr	100dB
M/9yr	95 dB	F/7.3 yr	105 dB	F/8-6yr	105dB
M/8.6yr	100dB	F/9 yr	110 dB	M/10 yr	105dB
M/8.3 yr	100 dB	F/7.3 yr	100 dB	M/13 yr	110dB
F/7 yr	95 dB	-	-	M/10 yr	100dB
F/7.4 yr	95 dB	M/10 yr	95 dB	M/11 yr	105dB
F/8 yr	100 dB	F/8 yr	100 dB	M/6 yr	100dB
		F/8 yr	100 dB		
F/9.6 yr	105 dB	M/10 yr	95 dB	M/6.6 yr	110 dB
F/9.2 yr	105 dB	F/8 yr	95 dB	M/12 yr	95 dB
F/9 yr	110 dB	-	-	F/10 yr	95 dB

Table 2 D Auditory Training Group

Experimental Group Nasik		Kolhapur		Control Group	
Sex/Age	Avg.Hearing loss	Sex/Age	Avg.Hearing loss	Sex/Age	Avg. Hearing loss
M/9.6 yr	80 dB	M/7.6 yr	85 dB	M/9 yr	75 dB
F/10 yr	75 dB	F/10 yr	80 dB	M/10 yr	85 dB
F/7.5 yr	75 dB	F/8 yr	80 dB	M/9 yr	90 dB
F/8.4 yr	85 dB	M/7 yr	75 dB	F/7.6 yr	90 dB
F/10 yr	95 dB	M/11 yr	75 dB	F/7 yr	85 dB
F/9 yr	90d B	F/8.6 yr	80 dB	M/7 yr	85 dB
M/8.9 yr	65 dB	F/6.9 yr	85 dB	M/8 yr	95 dB
F/8 yr	95 dB	F/11 yr	90 dB	M/10 yr	95 dB
F/9.4 yr	85 dB	F/10 yr	95 dB	F/7 yr	95 dB
F/ 9 yr	85 dB	F/10 yr	95 dB	F/7 yr	90 dB

Average hearing loss was defined as average hearing levels of 500 Hz, 1000 Hz, 2000 Hz of both ears and if the ear difference existed, average hearing levels of the better ear was taken into account.

The completed project has been evaluated qualitatively and quantitatively on self evolved language test.

4.2 Qualitative observation : Pre test language evaluation revealed following observations;

(1) Children were lacking sponteneous language. They failed to speak out on their own and needed to be questioned repeatedly.

(2) Very few children used sentences, if at all sentences were used, they were made by putting words one after other.

(3) Linking words were absent.

(4) Describing a picture, meant naming of objects presented in the picture. But no cognition was taken about an action.

(5) There was a great disparity in language skills among the children of same age; and of similar hearing loss.

(6) Children used sign language frequently. They appeared to be comfortable using sign with peers.

(7) Voice quality varied from no voice to extreme high pitch voice.

8) Intelligibility of speech varied significantly. Extremely poor intelligibility of speech made it difficult to judge the correctness of their responses.

9. Five children had different mother tongue and they were attending Marathi medium school.

10. Children receiving residential facility had limited language stimulation environment.

11. No specific language training approach was used in their school.

12. Children never received individualized programme and no target was set for these children.

13. Neither teachers had developed their own yardstick nor it was defined by the school. In other words, teachers had extremely low expectations from these children. Probably, teachers were underestimating potentials of these hearing impaired children.

Above observations raised certain serious questions regarding teachers competency to handle hearing impaired children; and also regarding development of curriculum programme for these children.

4.3 Speech Evaluation : All the children from the experimental graoup and control group demonstrated extremely poor performance on speech evaluation. In speech evaluation every

consonant and vowel was to be evaluated on the basis of placement of articulation, manner of articulation, voiceing. Similarly, every consonant in initial position, in middle position and in final position were assessed. Voice quality was assessed independently. It turned out to be extremely difficult task on teachers' part. It was also noticed that child may be able to produce a consonant in isolation but failed to produce at the word level. Similarly, limited vocabulary of these children made it difficult to assess all the positions of any consonant. There was also a lot of confusion in understanding difference between speech and language. It was observed that certain amount of vocabulary by itself was considered as language.

Teachers' role has been to teach the child to communicate by speech; i.e. to use speech as a vehicle for linguistic expression, so the teachers have to develop and to evaluate speech in linguistic context. Phonetic level evaluation would also be essential to determine the extent to which particular sound pattern were present or deviated from the normal pattern (9.)

It was observed that teachers failed to evaluate speech and suprasegmental features i.e. intonation, pause, stress etc. The analysis was essentially based on pass and fail criterion, but speech can not be evaluated on such a criterion. After extensive discussions with the teachers, it was decided to eliminate speech correction programme from the project.

4.4 Pre Test language Evaluation :

Subtest I : Test of nouns : In this test pictures and common objects were shown and the child was supposed to name it. Common tendency to use sounds related to words and not actual usage of words was observed. Such as barking for a dog; mew mew for a cat; and peep peep for a car. Some children preferred to mimic the word rather than using actual word. e.g. sign for peeling of a Banana; action of a sterring wheel for a car. Many children had very poor vocabulary and they failed to name the common objects.

Subtest II : To use noun in a sentence :
and Subtest:
III : To use noun as an answer to question.

Children seldom used complete sentence. They failed to give a sponteneous response, Unless questioned. None the less, general tendency to give noun (key word) as an answer to a question was observed. Few children described the picture as a boy, a book, a knife and did not respond correctly to an question asked.

Subtest IV : Test for singular- plural : This concept was absent in large number of children. Majority of children used numbers after counting to indicate a plural form e.g. one tree - five tree

one book - nine book

Few children used adjectives such as many, plenty to indicate plural, e.g. one book- many book. One tree- plenty tree. Few children felt that all the words change in similar fashion and kept on making standardized changes. This could be possible due to immitation of a demonstration item. such as,

पुस्तक - पुस्तके, चप्पल - चप्पले, खुर्ची - खुर्चे

Subtest V : Test for gender : The usage of gender in language was poor in most of the subjects. The majority of children failed in this subtest. The concept of gender, when present was limited to only human beings. The children named mother - father, boy- girl; but

could not differentiate as a bride- a groom. or grandfather- grandmother. Children had no idea that gender was a generalized concept and needed to be applied to animals, birds etc.

Subtest VI : Test for adjectives : The use of adjectives was limited to few adjectives. The common adjectives known were big-small and colours. Children failed to understand adjectives such as tall-short; fat-thin; long- short. Small and big pair was used for almost all the pictures. e.g. a fat boy was described as a big boy; and a long snake was also described as a big snake. The colour concept was significantly developed in most of the children and they could name black dog, red flower etc.

Subtest VII and Subtest VIII : Test for Verbs : A common observation was to indicate verbs by action, generally seen by gestures. Incomplete form of verb was used frequently. Children also failed to make appropriate changes in the verbs, so that it could match the subject.

Subtest IX : Test for prepositions : Very few children demonstrated the concept of preposition. The common prepositions known were up and down; but the usage of

up-down did not exist in broader sense. e.g. On the Chair; under the chair, on the tree and under the tree were well expressed by the subjects. Children failed to describe over the bridge, under the bridge, and on the road. The use of prepositions such as in and out, ahead and behind; far and near were known by very few children.

Sub Test X :Test for Cases : Majority of children failed to demonstrate the proficiency in usage of cases. They could make sentences by putting words one after other but the connecting words were lacking in most of the subjects.

Subtest XI :Story Telling : Majority of children failed in the story. They could not describe series of events occured in the story. Most of the children were pointing out the objects seen in the picture without any appropriate sentence structure. Concept of narrating of experience/event was poorly developed in these children. Speech intelligibility was poor and usage of gestures and sign was maximum.

4.5 Interim Test Evaluation : Interim language evaluation was done at Nasik and Kolhapur during March 1990-April 1990, as schools were breaking for their summer vacation. During the evaluation it was noticed that

teachers have taught all the test items included in the test. Most of the children showed significant improvement in the scores. It was decided not to take into account the contaminated scores of interim test. The test was not given to the control group for the same reason. It was decided to restructure the test. The format was kept constant but toally new items were selected by two judges and a new test was made ready for the final evaluation.

4.6 Final Test Evaluation : Post test evaluation was done during September 1990- October 1990. There was a remarkable improvement in the performance of the children involved in the experimental group. There sponteneous language improved a lot. Children became more expressive and tried to use complete sentence in many occassion. Usage of signs was decreased remarkably but they continued to use signs among the peers. Detailed observations of post test evaluation.

Subtest I : Test of nouns : Children could identified all ten items involved in the test. There answers were in a complete sentence form. e.g. This is a ball, This is a car. They did not use any signs to denote objects.

Subtest II : To use noun in sentences : Children did equally well on this test; and were responding appropriately to the questions asked.

Subtest IV : Test for singular -Plural : Children developed the concept of singular and plural . They also learnt that the words change while using a pleural form. e.g. झाड - झाडे but their tendency was to use a generalized pattern

झाड - झाडे , खुर्ची - खुर्चे

Subtest V : Test for gender : A remarkable improvement in this test. Children demonstrated their upgrading on this test. It was observed that the concept of gender in relation to human beings was very well developed and in case of animals it was limited to few animals e.g.

कोबडा - कोंबडी
बैल - गाय
मोर - लांडोर

The possible **explanation** could be that these children were taught through visual aids; by graphics or picture presentation, so it might have been difficult to teach the concept of gender. Similarly there are far and few stories like " Papa Bear and Mummy Bear " in vernacular language, so gender concept has been confined to human beings.

Subtest VI : Test for adjectives : Children showed enrichment in usage of adjectives.

Teachers also reported that they noticed a general trend of using adjectives in conversation. A bright day; a funny game, tired Sunil; stale

vegetables etc. were sponteneous respondes elicited by these children. Teachers also reported that students often asked " specific word " denoting an adjective and seldom used " big- small " in a generalized manner.

Subtest; VII : Test for Verbs : Concept of " to be " verb was very well established. Concept of tense was also developed significantly. Few children continued to make errors in making appropriate changes in the verbs to match the subject.

Subtest: IX : Test for prepositions : Children demonstrated progress on this subtest but application of prepositions in broader sense remained to be difficult for these children. Probable explanation could be there are no generalized rule for the usage e.g. on the road; in the car, on the scooter; in the sky, appeared to be difficult concept for them.

Subtest: X : Test for Cases : Children showed remarkable progress on this test children learnt to respond to ' whom ' questions. e.g. पोलीस कोणाला मारतो ?

पोलीस चोराला मारतो. Children were making attempts to make necessary changes in the words e.g. पोपटाला, मुलाने etc. but errors continued.

Subtest XI : Story telling : It was observed that children could narrate very few stories. They were lacking spontanity in narration. The judgement was based on a rating scale, hence children were shown a picture and were asked to describe it. Children from Nasik performed well. Usage of adjectives was prominantly observed. But the rating was based on the intelligibility of speech, hence children scored low points on the scale. Children from Kolhapur could describe the picture but speech was poorly developed. Children from Pune used maximum gestures and sign language.

4.7 Teacher's evaluation : Through out the project, teachers demonstrated different philosophies towards special education among themselves. Teachers from the experimental group as well as the control group did not form a coherent group. Teachers from Nasik had received their training programme from Central Institute of the deaf, Bombay and teachers from Kolhapur and Pune had received their training programme from V.R.Ruia Muk Badhir Vidyalay, Pune. Both these training programs have totally different philosophies. All the teachers from Mai Lele Shravan Vikas

vidyalay, Nasik had received training programme from Central Institute for the deaf, Bombay, so the teachers formed a homogenous group within the school, which reflected upon children's language development; but these children did poorly on speech evaluation. Teachers were also not taking significant efforts for speech corrections.

Teachers from Kolhapur, Pune did not demonstrate any specific philosophy. There did not exist any structured programme, although they claimed that they used natural approach for language stimulation. Once the structured activities started, teachers from Kolhapur worked hard and they indeed showed remarkable improvement in their teaching methods and it was obviously reflected positively upon language development of hearing impaired children. By and large it was observed that teachers demonstrated significant lack in understanding of linguistics and the rules of grammer to facilitate the instructions of complex language form. As all the language rules do not fit into a sequential pattern, teaching must be carefully planned and must be integrated into the environment; but teachers failed to demonstrate their skills and flexibility in planning and implementing defined units. It was also observed that all the schools

gave more emphasis on cultural as well as non academic activities. Teachers often complained about difficulty in implementing complete curriculum developed for these children.

Teachers' knowledge regarding hearing aids, types of aids, common defects in hearing aids, residual hearing and auditory training appeared to be inadequate. They could not discuss certain issues like why do children reject hearing aids? How to distribute weightage of TVA approach (tactile, visual, auditory stimulation) to an individual? Similarly, child's poor performance was often attributed to his environment but failed to understand that there could be built in factors. Hearing impaired children may have learning disability, short memory and/or short attention span, such factors were not taken into account. None the less, teachers demonstrated their competency in the project, they also worked hard to achieve the desired results. Teachers also demonstrated progress in their understanding of deafness and methodology, Although, measurement of behaviour modification of teachers attitude was not the scope of this project, teachers attitudes were changed significantly.

4.8 Quantitative Analysis : To compare the means of pretest and post test of language evaluation : To determine the significance of the difference between the means of pretest and post test the ' t ' test was used. (20). The problem under consideration was concerned with " the significance of the difference between means obtained from the same test administered to the same group upon two occassions " This experimental design, called as the ' single group method ' was applied to measure the effect of single modality stimulation upon the post test scroes. In order to determine the significance of the difference between the means obtained in the initial and the final evaluation, the following formula was used,

$$SE_{Dm} = \sqrt{\sigma^2_{m_1} + \sigma_{m_2}^2 - 2\, r_{12}\, \sigma_{m_1} \sigma_{m_2}} \qquad (I)$$

SE_{Dm} = Significance of the difference between the means.

m_1 = standard error of the pre test.

m_2 = standard error of the post test.

r_{12} = Coefficient of correlation between scores.

The project had concentrated on two different modalities for input; and there were two different experimental groups i.e. Nasik and Kolhapur, while Poona group was considered as a control group. Therefore test of significance of the difference was applied for speech reading group and for auditory training group independently.

The pretest evaluation was done during November 1989 to December 1989 and the post test evaluation was completed during September 1990 to October 1990. Raw scores of the students on pre test and post test.

Table No. 3 a Speech Reading Group

Experimental Group				Control Group	
Nasik		Kolhapur		Pune	
Pre test	Post test	Pre test	Post test	Pre test	Post test
7	57	2	10	30	5
6	31	6	16	1	2
25	28	7	46	3	2
24	53	1	4	0	1
27	47	0	53	0	0
3	11	2	51	0	0
1	22	0	34	3	2
0	20	23	57	0	1
9	37	17	42	34	42
32	65	-	-	0	5

Raw Scores of the students on pre test and post test

Table No. 3. b   Auditory Training Group

Experimental group				Control Group	
Nasik		Kolhapur		Pune	
Pre test	Post test	Pre test	Post test	Pre test	Post test
1	24	16	63	33	30
14	51	17	45	0	5
33	70	4	-	0	2
41	76	2	28	9	7
35	70	23	41	0	2
43	64	19	-	19	21
34	61	3	21	0	1
-	46	16	79	2	5
14	45	4	58	4	3
6	54	3	22	4	4

t =test :

4.8 To determine the significance of the differences between the means the ' t " test was used. For 't' test the standard error of the difference between the means SE_{D_m} was required. To get the SE_{Dm} the standard errorsof the different means, the coefficients of correlation between the two sets of scores were calculated.

Following two tables revealed the details.

Means, Standard errors, coefficient of correlation

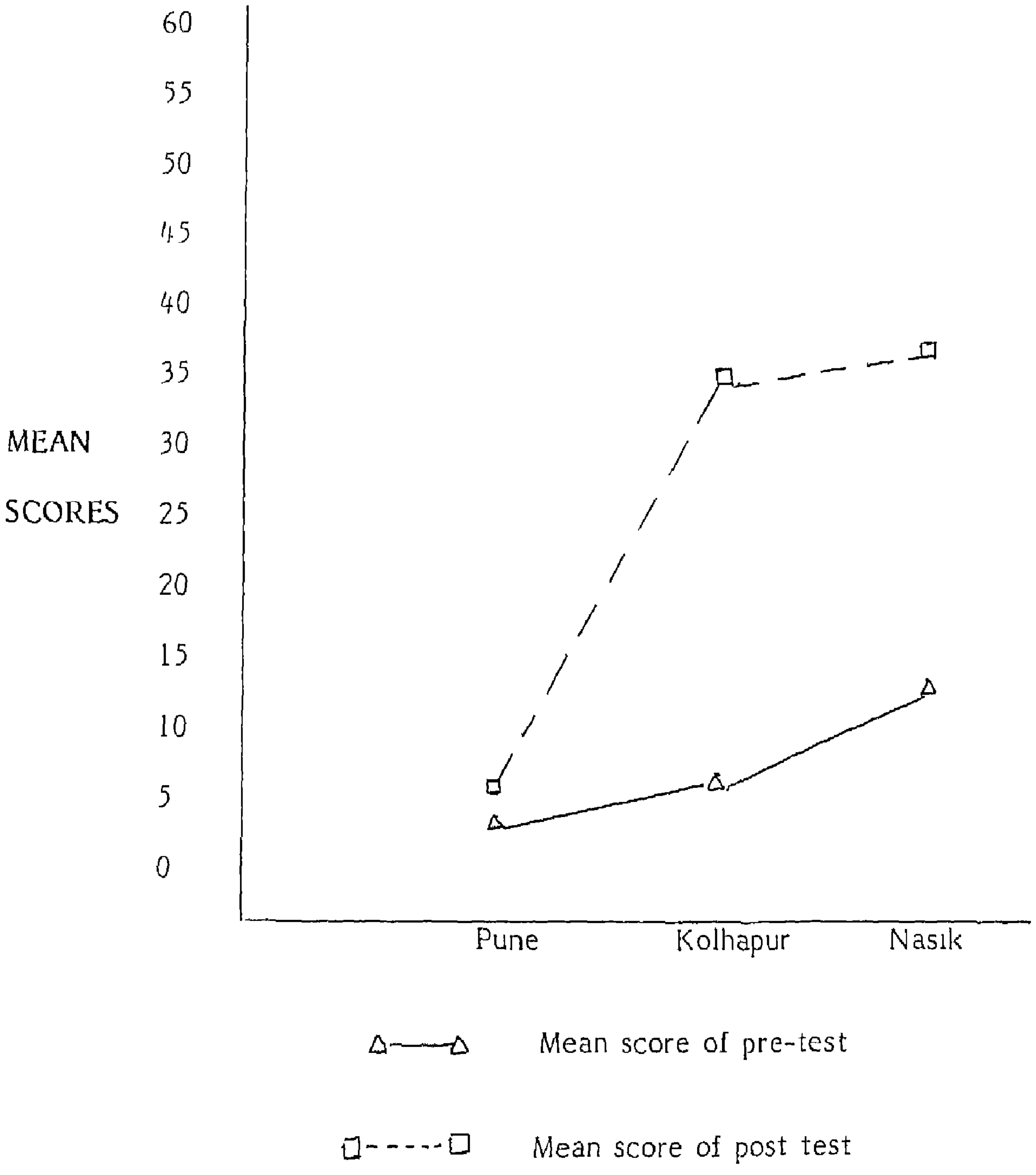
Table 4-a — Speech Reading group

Group	Control Pune		Experimental Kolhapur		Experimental Nasik	
	Pre-test	Post test	Pre test	Post test	Pre test	Post test
Means	4.40	6.00	6.44	34.78	13.40	37.10
No. of students	10	10	9	9	10	10
Standard errors of means	3.32	4.04	2.73	6.65	3.85	5.62
Coefficient of correlation	0.91		0.42		0.68	

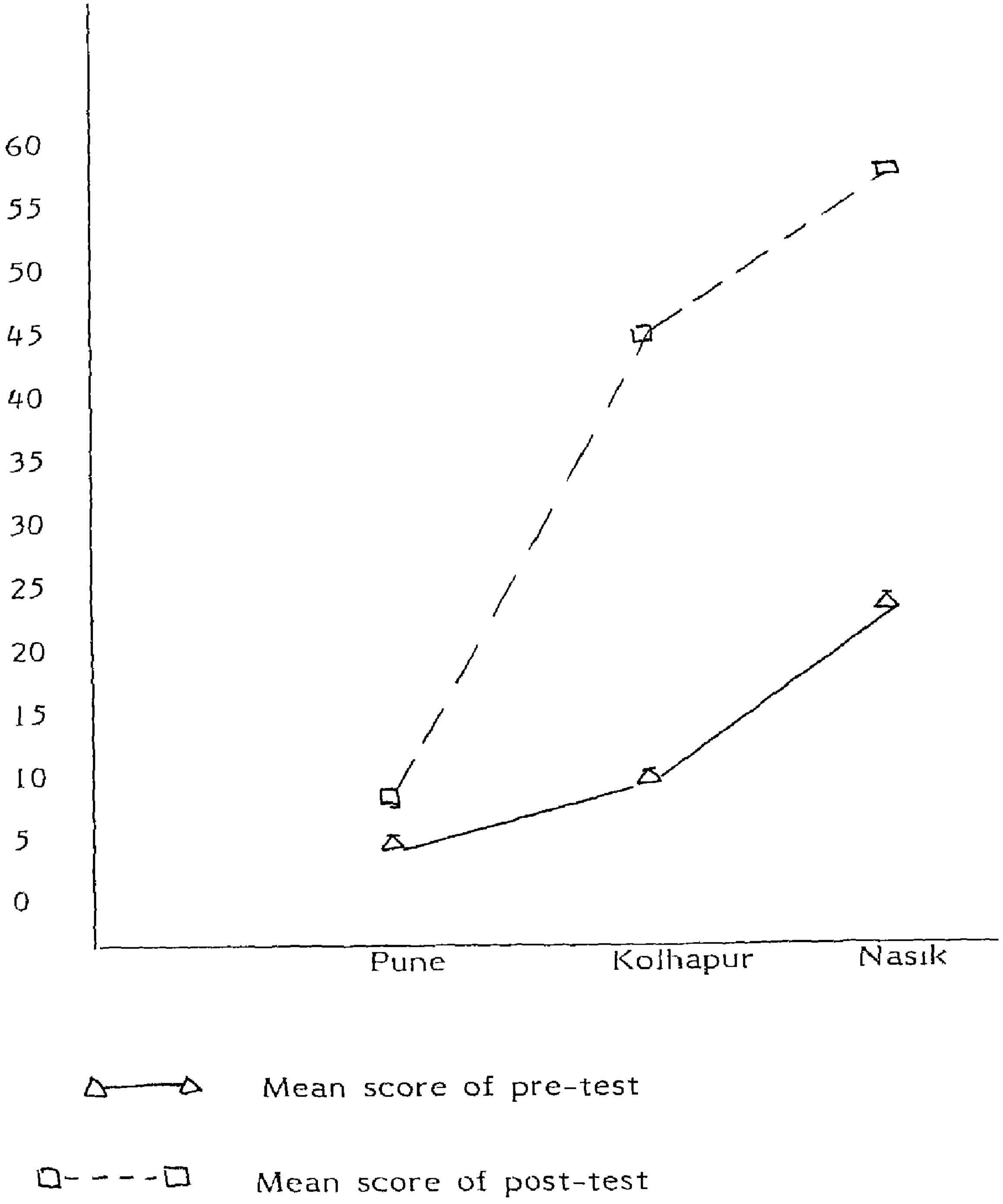
Table No. 4 - B — Auditory training Group

Group	Control		Experimental Kolhapur		Experimental Nasik	
Test	Pretest	Post test	Pre-test	Post test	Pre test	Post test
Means	7.10	8.00	10.00	44.63	24.56	57.22
No. of student	10	10	8	8	9	9
Standard errors of means	3.44	3.04	3.01	7.39	5.28	4.36
Coeffient of correlation	0.98		0.52		0.92	

SPEECH READING GROUP



AUDITORY TRAINING GROUP



To calculate SE_{D_m} the above stated formula No. I was used.

The 't' values (critical ratio) were determined by the formula.

$$t \text{ value} = \frac{\text{Difference between the means}}{\text{Standard error of difference between the means}} \quad \text{(II)}$$

These obtained " t "values were compared with the limits of the significance for the given degrees of freedom Table No. 5 a, 5 B indicated the values.

Table No. : 5-a Speech Reading Group

Group	Differences between the means of pretest & post test	SE_{D_m}	df	Obtained t values	Limits of Significance	
					0.05 level	0.01 Level
Control	1.60	3.89	9	0.41 □	2.26	3.35
Experimental Nasik	23.70	5.64	9	4.20 +	2.26	3.25
Experimental Kolahpur	28.34	6.63	8	+4.27	2.31	3.36

* Highly significant at 0.01 level

□ Not significant at any level.

Table No. 5 - b Auditory Training Group

Group	Differences between the means of pretest and post test	SE_{D_m}	df	Obtained t values	Limits of significance 0.05 Level	0.01 Level
Control	0.90	3.29	9	0.27 □	2.26	3.25
Experimental Nasik	32.66	5.08	8	6.43 *	2.31	3.36
Experimental Kolhapur	34.13	7.22	7	4.73 *	2.36	3.50

* Highly significant at 0.01 level.

□ Not significant at any level.

Table No. 5 a, 5 b demonstrated that the differences between the means scores of the pretest and post test for speech reading group as well as for auditory training, i.e. experimental groups were " highly significant " even at 0.01 level, while the "t" scores of control group were not significant even at 0.05 level.

4.9 Analysis of Coveriance : In the present study the research worker wanted to study the relative effectiveness of the two methods of teaching on the achievements of the hearing impaired children, having similar degree of hearing loss, Besides these two variables (modality of stimulation;

degree of hearing loss), previous language development was an important factor affecting the achievement. This factor called as ' cognitive entry behaviour ' needed to be partialled out, hence " Analysis of Covariance " was used to find out the significance of the difference between the post tests for the different groups.

By the application of ANACOVA, the influence of the uncontrolled variable is usually removed by a simple linear regression method. ANACOVA represents an extension of analysis of variance to allow for the correlation between initial and final score. It is useful for various reasons, (1) it is quite difficult though not impossible to equate the groups at the beginning. (2) Through covariance, one is able to do adjustments in final or in terminal scores which will allow for differences in initial variable.

4.9.1 Significance of the difference between the means of post tests for the speech reading test.

: The scores of the pre test were denoted by 'x' and that of the post tests by 'y'. The product was denoted by ' xy '. For the analysis of co-variance among the group mean sum of the squares was denoted by S.S. Within the groups sum of the squares (SS) for the x test, y test and for the products xy were

calculated. Similarly the adjusted sum of squares for the ' y ' test $SS_{y,x}$ were also calculated.

Table 6.a and 6.b revealed the details of the ANACOVA.

SUMMARY OF ANALYSIS OF COVARIANCES

Table 6.a Speech reading Group

Source of variance	dt.	SS_x	SS_y	SS_{xy}	SS_{y-x}	$M.S_{y-x}$ (Vy-x)	SD_{y-x}
Among the means	2	476.43	5443.71	1248.70	3366.36	1683.18	-
Within the group	25	2829.02	6963.12	2570.82	4626.73	185.08	13.60
Total	27	3305.45	12406.83	3819.52	7993.29	-	-

Table 6-b Auditory Training Group

Source of variance	df.	SS_x	SS_y	SS_{xy}	SS_{y-x}	$M.S_{y-x}$ ($V-y-x$)	$S\ D_{y-x}$
Among the means	2	1576.73	12473.7	3701.13	3346.22	1673.11	-
Within the groups	23	3551.12	5934.03	1322.39	5441.59	236.59	15.38
Total	25	5127.85	18407.79	7023.52	8787.81	-	-

The ' F ratio was calculated using the following formula.

$$F_{y.x} = \frac{\text{Among the means variance}}{\text{Within the groups' variance}}$$

$$F_{y.x} = \frac{1683.18}{185.08} = 9.09$$

$F_{y.x}$ = 9.09 for speech reading group.

This obtained 'F' ratio was compared with the **limits** of significance of the 'F' ratio (20), The following table indicates the details.

The significance of the f ratio for the degree of freedom dt 2/25

Table 7.a

Speech Reading Group

Obtained f ratio	Limits of significance 0.05 level	Limits of significance 0.01 level	Significance
9.09	3.38	5.57	Highly significant at 0.01 level

Similarly the f ratio was calculated for the auditory group; using the same formula.

Exm. $F_{y.x} = \frac{\text{Among the means variance}}{\text{Within the groups variance}}$

$$F_{y.x} = \frac{1673.11}{236.59} = 7.072$$

$$F_{y.x} = 7.072$$

The obtained ' f ratio ' was compared with the limits of significance of the ' f ratio ' (20)

The significance of the ' f ratio ' for the degrees of freedom (df) 2/25.

Auditory Group

Table 7.b

Obtained f ratio	Limits of significance 0.05 level	Limits of significance 0.01 level	Significance
7.072	3.42	5.66	Highly significant at 0.01 level

'f' ratio values appeared to be highly significant, at 0.01 level for the speech reading group as well as for the auditory training group, which can be concluded that some differences between the means of the post tests were significant. To decide which difference between the means appeared to be significant, the means of the post test were adjusted. For such adjustment the regression coefficient for within the groups was to be calculated by using following formula.

$$\text{'b within'} = \frac{(\ x{\times}y)^2}{(\ x{\times}2\ )} = \frac{\text{Within the groups SS for xy}}{\text{Within the groups SS for x}}$$

'b within '

$$\text{for speech reading group} = \frac{2570.82}{2829.02}$$

$$= 0.909$$

'b within '

$$\text{for auditory training group} = \frac{1322.39}{3551.12}$$

$$= 0.37$$

With the help of 'b within' the adjusted means for y (post test) were calculated, by using the formula.

$$\text{M adj} = \text{My} - \text{b}\ (\ \text{Mx} - \text{Gmx}\ )$$

Where my, & mx, and Gmx were means for the post test (y), pre test (x) and the general mean for x.

Table 8 a and 8b will show the adjusted means for the post test (y)

After adjusting the means for the post test (y) the standard errors of the differences between the adjusted means of the post tests (y) were calculated using the formula

$$SE_{D_m} = SD_{y-x} \sqrt{\frac{1}{X_1} + \frac{1}{X_2}}$$

From these standard errors of the differences between the adjusted means the 't' values were calculated by using the formula.

$$t \text{ value} = \frac{\text{Difference between the means}}{\text{standard error of the difference between the means.}}$$

These obtained 't' values were compared with the limits of significance of the t values, for df 25.

The table 9a and 9 b gives the details.

Adjusted Means for the post tests (y)

Table 8-a Speech Reading Group

Groups	N	Mx	My	Adjusted mean
Control	10	4.40	6.00	9.40
Experimental Nasik	10	13.40	37.10	32.32
Experimental Kolhapur	9	6.44	31.44	32.99
General Mean	-	8.14	24.62	24.62

Table 8-b Auditory Training Group

Groups	N	Mx	My	Adjusted Mean
Control	10	7.10	8.00	10.54
Experimental Nasik	9	24.56	57.22	53.26
Experimental Kolhapur	8	10.50	44.63	45.90
General Means	-	13.93	35.26	35.26

Significance of the differences between adjusted means.

Table 9.a Speech reading Group

Difference of means between the groups	Difference between the adjusted mean	SE Dm	dt.	Obtained t values	Limits of significance	
					0.05 level	0.01 level
Kolhapur Pune	23.59	6.25	25	+ 3.77	2.06	2.79
Nasik Pune	23.12	6.08	25	+ 3.80	2.06	2.79
Nasik Kolhapur	0.47	6.25	25	0.08 □	2.06	2.79

Table 9. b Auditory Training Group

Difference of means between the groups	Difference between the adjusted mean	SE Dm	dt.	Obtained t values	Limits of significance	
					0.05 level	0.01 level
Kolhapur Pune	35.36	7.30	23	+ 4.84	2.07	2.81
Nasik Pune	42.72	7.07	23	+ 6.04	2.07	2.81
Nasik Kolhapur	7.36	7.47	23	0.99 □	2.07	2.81

+ Highly significant at 0.01 level

□ Not significant at 0.05 level.

Above tables revealed that the difference between the adjusted means of the post tests of Kolhapur and Pune and Nasik- Pune were highly significant at 0.01 level which indicated that single modality approach worked effectively over multisensory approach. The difference between the adjusted means of the post test of Nasik- Kolhapur was nonsignificant at 0.05 level; that means experimental group performed equally well and the built in differences between the schools did not affect on the language development scores.

CHAPTER - V

Summary, Conclusions and Recommendations

Effect of single modality stimulation upon speech and language development of hard of hearing individuals was studied on forty subjects. This chapter highlights following points on this topic.

1) Need and significance of the present study,
2) Statement of the problem,
3) Objectives of the study,
4) Procedure,
5) Major findings,
6) Conclusions,
7) Recommendations.
8) Suggestions for further research.

5.1 Need and significance of the present study : There have been very few research activities in the field of special education. Hence the progress of handicapped children is often measured on the relative terms. Although, individual differences due to onset of handicap; degree of handicap and environmental factors make any handicap category as a heterogenous group; there have been very few attempts to study these factors. Similarly, special school curriculum has never been made compatible with normal

school curriculum. Hearing impaired children significantly lag behind in their functional language development by two to three years (1,2), but the informal survey revealed the lag is more than three years. There does not exist any language skill norm developed for these children, hence children are often underestimated. Similarly, individual hearing aid is considered as an integral part of language development by the teachers and by the parents and they also feel that " significant language development is only achieved by the good hearing aid ". There are good number of hearing impaired individuals who are poor candidate for amplification; and those children can do without the hearing aid. The present study has demonstrated that children can be taught without any auditory gadget. Profound hearing loss individuals can do significantly well without hearing aids, on language development skills. Spending minimal amount on various electronic gadgets will bring a cost effectiveness in school management. Children need a structured programme and a good follow up can bring desired effect in hearing impaired children, from special schools. Children can learn language skills effectively and in comparatively short duration, if proper modality stimulation programme is implemented.

Statement of the problem : Single modality (visual or auditory) stimulation to its maximum capacity should reflect positively upon speech and language performance of hearing impaired individuals.

Objectives of the study : (1) To measure hearing loss of children participated in the project.

(2) To form a homogeneous group in the classroom with reference to hearing sensitivity along with chronological age.

(3) To evolve a scale for measurement of language skills.

(4) To find out individual needs of the student and to plan an individualized programme of language development.

(5) To identify speech problems and to grade quality of speech and voice.

PROCEDURE : This project aimed at a comparative study of single modality stimulation (visual or auditory) vs multimodality stimulation for language development of hearing impaired individuals. 10 children for auditory training group as well as for speech reading group were selected from Mai Lele Shravan Vikas Vidyalay, Nasik and Vinaykumar Lohia Muk Badhir Vidyalay, Kolhapur. Children from Chinchwad Muk Badhir Vidyalay, Nigadi, Pune were treated as a control group. These children were selected and were matched with the experimental

group. A self evolved tool for language assessment was used in this project.

The language development of each hearing impaired child was assessed prior to the project and after the completion of the project; in order to judge the improvement in language skills and usage.

Formal training programme of language stimulation was implemented during the period of December 1989 to August 1990. A combined approach (structured approach + natural approach). with heavy emphasis on structured approach, was used for language stimulation programme. The outcome of the project was treated qualitatively and quantitatively. Quantiative evaluation was done using 't' test as well as ANACOVA test.

5.5 MAJOR FINDINGS : Children demonstrated significant language development under this project. Their sponteneous language improved remarkably. They started using complete sentence form and also started using enriched vocabulary. Children learnt to comprehend who? What?When?Whom? questions and also learnt to respond appropriate to questions asked Children from speech reading group and children from auditory training group did equally well on

the language test. Their language development was significant. All the special schools have a claim of adopting " natural approach " for language stimulation; but it seems that structured approach or combined approach (structured approach +natural approach) works better than natural approach; however, comparative study of two approaches was not the scope of this project.

Single modality stimulation for language development works effectively and it appears to be superior to multimodality approach. In multimodality approach a weightage needs to be defined for tactile, visual and auditory stimulation (TVA approach) as per the requirements of a child; but it is seldom defined. Single modality approach concentrates on only one channel and is used to its maximum capacity to elicit positive responses. Similarly children do have modality preference and that needs to be identified. It can be assumed that children having residual hearing can be taught to use auditory channel to its maximum capacity, since, our language is an auditory phenomenon, one designed for hearing and not for viewing (5). Children with profound hearing loss are better candidates for speech reading. But there are few children with good amount of residual hearing, who exhibited poor candidacy for

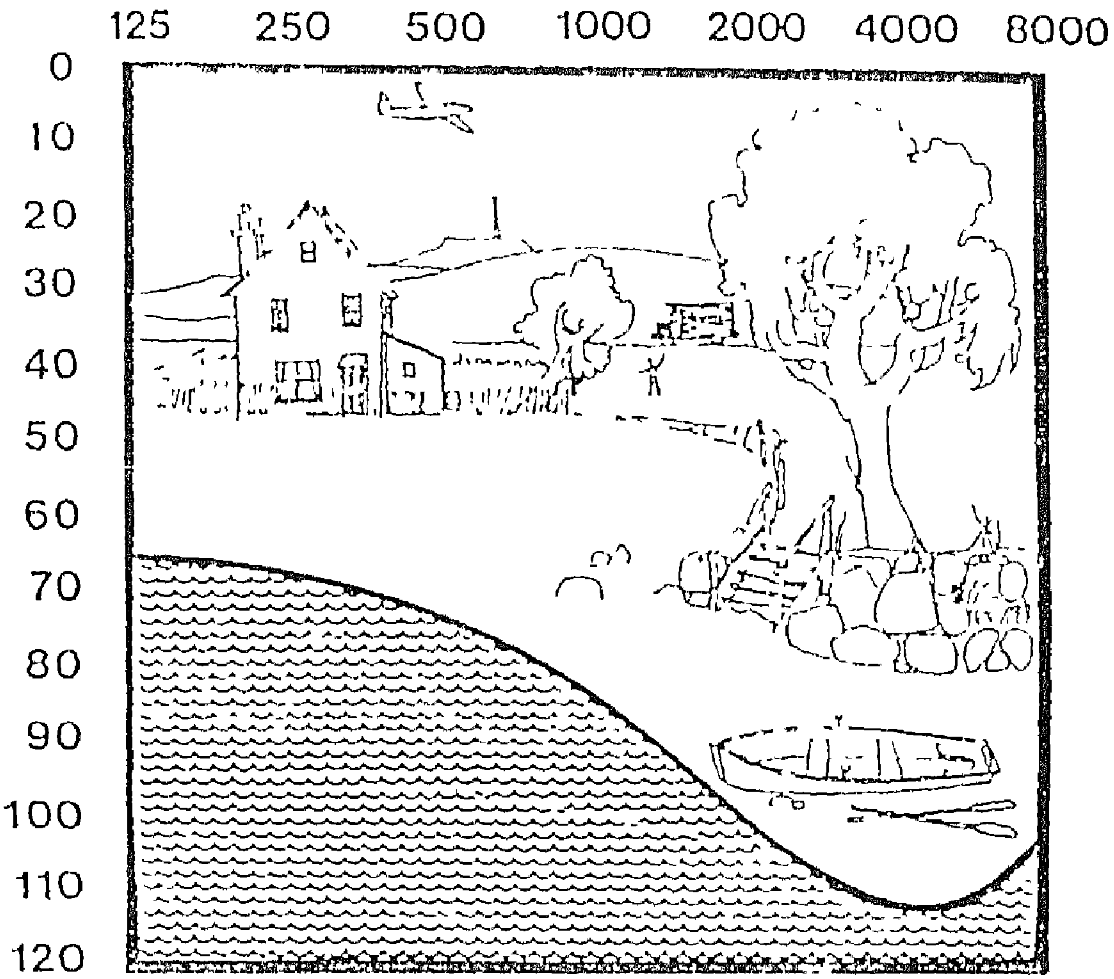
amplification due to some physiological factors, such as poor dynamic range, recruitment, persistant discharging ears. These children were considered for visual modality stimulation.

5.6 Conclusions : The project has demonstrated that hearing impaired children can be taught using single modality stimulation approach. Single modality stimulation can elicit good amount of language development. Auditory modality and visual modality stimulation have similar type of language development. If individualized approach is used in modality stimulation as well as in structured language stimulation programme a positive result could be achieved in a short duration. There are good number of hard of hearing individuals in India, who are without hearing aids, they can be taught effectively with speech reading approach.

Gajendragadkar, S.N. (21) report revealed that there are about 2.5 million deaf people in India. The total number of handicapped persons is about 10% of the population and this increases by about 40,000 persons every year. The facilities for deaf include 117 special schools, 18 speech and hearing center, 13 special employment exchanges

and six vocational rehabilitation centers. The recent report on " Education of the deaf in India " by Roy R (3) has also highlighted similar information. Although, ' early identification and early intervention programme " is emphasized in the literature, it is far from reality. So the children are deprived from language stimulation programme for good number of years. In present situation, when special schools have poor ' funding, and intervention programme begins at the age of six and above single modality stimulation may be considered as a recommended approach for language stimulation.

Recommendations : (1) Hearing impaired children have modality preference, and the same can be identified. (2) Children who have profound hearing loss can be considered for speech reading stimulation. (3) Children who have dislikes towards amplification due to poor dynamic range, recruitment, discharging ears need to be identified. (4) Good amount of residual hearing may not contribute to language development due to reduction in ganglion cells (12), And as Daniel Ling (9) has stated that audiogram provides no information on the quality of audition present



An audiogram in which the threshold is compared to a shoreline The contour of the shoreline tells nothing about the quality of water; similarly, the threshold curve yields no information about the quality of hearing present at suprathreshold levels (Daniel Ling, 1972)

at these levels. Some children may not benefit with hearing aids, if so, they should be recommended not to use hearing aid.

(5) At the time of intervention programme, multisensory approach can be implemeted but after a year of training, the cases need to be reevaluated and child's modality preference should be identified.

(6) This approch is not applicable to the hearing impaired children, identified prior to the critical age of language learning. For these children multisensory approach is strongly recommended, however, if the child fails to demonstrate language development then he should be subject to single modality stimulation.

Formation of homogenous group with reference to hearing loss along with chronological age, in the classroom is strongly recommended.

Suggestions for further research

(1) Present project was designed for one academic year, a longitudinal study on measurement of effect of single modality stimulation is recommended.

(2) The study did not take into account development of speech and correction of speech by single modality, further research on speech is also

recommended.

(3) A comparative study of natural approach and structural approach for language and training is essential.

(4) A comparative study of language development of hearing impaired children in mainstream programme and in special school is recommended.

(5) Development of a standardized language evaluation test is also recommended.

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